Remarks

In view of the following remarks for respectfully traversing the Examiner's rejections, favorable reconsideration of the outstanding office action is respectfully requested.

Claims 1 - 28 remain in this application. The Applicant thanks the Examiner for the telephone discussion on September 9, 2003. A list of references previously filed with the original IDS is attached, as appendix A.

1. Drawings

The Examiner has indicated in the accompanying form PTO-948 that the formal drawings previously submitted have been approved.

2. § 103 Rejections

The Examiner has rejected claims 1-4, 6, 7, 10-17, and 19-28 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Ball, et al. (U.S. Patent No. 6,031,849) in view of Ohishi, et al. (U.S. Patent No. 5,309,452).

Regarding independent claims 1, 27, and 28, the Examiner agrees that Ball fails to disclose the inner cladding as having an inner cladding cross-sectional area between 2 and 25 times greater than that of the core cross-sectional area as an unsuggested combination proposed by the Applicant because Ball only discloses an example of a fiber having a cladding cross-sectional area approximately 31 times greater than the core cross-sectional area. The Examiner however asserts that Ball teaches an optimal V-value between 2.0 to 2.2, which depends upon the numberical aperatrue (NA) of the fiber and the operating wavelength in addtion to the core diameter. Furthermore, the Examiner asserts that Ohishi teaches a more extended range for the acceptable V-value for a single mode fiber (Col. 3, lines 47-53). The Examiner then asserts that it would have been obvious to one of ordinary skill in the art to have provided a larger core corss-sectional area and thus a smaller ratio between the core area and first cladding. For the use of a single mode fiber as taught by Ohishi, the acceptable range for the V-value of the fiber is increased and the Examiner thus concludes that increasing the necessary diameter of the core allows Ohishi to attain the taught V-value. The Examiner surmises that one would have been motivated to increase the size of the core to allow the amplifier to operate at higher wavelengths without experiencing single mode cutoff by maintaining the V-value within the prescribed range.

The Applicant respectfully traverses the Examiner's rejection and arguments because the Applicant's claimed cladding to core ratio between 2 and 25 is an unsuggested

combination" that Ohishi too failed to disclose. The V-value is a misunderstood reference, as used by the Examiner. In both Ball and Ohishi, the "d" refers to the diameter of the core and does not impose any restrictions on the cladding. (Ohishi, col. 3, line 41 and Ball, col. 5, line 52). It is possible and well known to have a core with V=2-2.2 and cladding with the cross-section more than 100-400x that of the core, as with the Polaroid example in the background of Ball (col. 1, lines 51-53), without expanding the core. Contrary to the Examiner's assertions, the acceptable range for the V-value was NOT increased from Ball to Ohishi. In col. 5, lines 54-55, Ball too taught that "the V-value must be kept below 2.405" which is basically the same teaching as Ohishi. Even if the Examiner uses the prior "most likely values" of Ohishi (filed 1992, col. 3, lines 51-52) of "2.3" to compare with Ball's "practical" design of "2.2" (filed 1997, col. 5, line 55) to imply that the core diameter of Ball has to somehow grow to satisfy the V range of Ohishi, then Ball's clad to core area ratio is 29.65 instead of Ball's original 31, which is still higher than the 25 taught in the independent claims. There is nothing in Ohishi to suggest that the core diameter should be increased. In fact the core diameter is never given, only the cladding dimensions in col. 4, lines 28-29. Using the cladding dimensions of 40 by 120 given in col. 4, lines 28-29 of Ohishi to calculate the cladding area of 4800, with the 4 micron diameter given in Ball (Ball, col. 6, line 29), would result in a core area of 12.56 to come up with a clad to core ratio of 4800/12.56= 382 which is in the conventional known range. There is no difference in wavelength that is not contemplated by Ball or Ohishi, to motivate someone to increase the size of the core. Hence, increasing the necessary diameter of the core was never taught or otherwise suggested by Ohishi to attain the taught V-value that is basically the same as Ball's in the first place.

Because independent claims 1, 27, and 28, and their dependent claims, all contain "the inner cladding having a cross-sectional area approximately 2 to 25 times larger than the core area" limitation that was not suggested or obviated by Ball, singly or in combination with Ohishi, all of the Examiner's rejections are overcome to render the claims now allowable.

Even though claim 2 is now believed allowable because it depends from claim 1, it will be further emphasized that the unsuggested combination of a CCR of 2-25:1 of independent claim 1 has not been used before with a single-mode core.

Regarding claim 3, which should also be allowable because it depends from now allowable claim 1, the Examiner's original rejection is traversed by the misunderstood reference arguments to claim 1. Furthermore, the Applicant's claim 3 is a solution particularly directed to an unrecognized problem of the degree of difficulty of 3-level

systems. Ball does not fully recognize that for 3 level systems with the competing 4-level transition, such as Yb at 980 nm or Nd at 940 nm, lasing/amplification can not be achieved with any acceptable efficiency for any pump power density, if the restriction on clad/core area ratio taught by the claimed invention is not observed, since competing transition will lase first. By giving an example of Yb-doped fiber laser with a CCR of 31:1 (which is not practically usable) Ball effectively teaches an inoperative combination and also teaches away from the claimed invention of CCR of 25:1. Even though Ball recognizes that Yb at 980 nm is a 3-level laser, he fails to recognize that it would not work at all (or at least with more than a couple percent efficiency) if his clad-to core area ratio is 31.

As is well known in the art, single-moded means that V value is below cutoff of the higher order mode, which for step-index profile means 2.4. If one was to take Ball's design and increase V from 2.2 to 2.4 (and it can not be increased more than that without making the core multi-moded), that would make Ball's clad to core area ratio 28.4 instead of 31, which is still significantly higher than 8, and claim 3 teaches that 8 is the maximum for Yb at 980 nm.

Ball's claim 13 talks about inner cladding of 4x100 um, which means an inner cladding area of 400 um^2 (less than 780) and a CCR of 31.8. However, he does so a) in reference to the fiber laser, not an amplifier and b) in reference to the design that in principle does not allow CCR of less than 28.4. Even though the ending of Ball's claim 14 is a bit confusing, but if Ball's cladding diameter is 50 um, then CCR is (50/4)^2=156, because area is proportional to diameter squared. It is hoped that once the Examiner rechecks his calculations, it will be apparent that a CCR of less than 25 was never taught in any of the references to be able to obviate the Applicant's claims.

Regarding claim 4, which should also be allowed because of the previously discussion, it should be further noted that it is generally known that certain pump power density is required to reach the population inversion as seen in Ball's Eqn. 8. However, it was not recognized and suggested until the claimed invention, that the inversion level that can be reached with a given pump power and cladding area also depends on the amount of pump power left unabsorbed by the active medium, thereby placing restriction on the cladding area as given in dependent claim 4.

Regarding claims 6 and 7, as discussed already, Ball's and Ohishi's misunderstood teachings about V-value of the core do not affect the diameter of the inner cladding or its unsuggested combination with the cladding NA of dependent claims 6 and 7, which should already be allowed because they depend from allowable independent claim 1.

Regarding claims 10, 11, 19, 20, 23 and 26, as discussed already, the unsuggested combination of the particular CCR given in independent claim 1 was not contemplated to obviate the Examiner's rejections.

Claim 12 should be allowed because it depends from now believed to be allowable claim 1. Furthermore, even though it is known that graded-index waveguides allow for a larger mode area while remaining single-moded, it was not suggested by anyone else to use this fact to decrease the CCR. Therefore, this unsuggested combination overcomes the Examiner's rejection.

Regarding claims 13, 24 and 25, signal-absorbing dopants are known, however, it is an unsuggested combination to use such dopants to discriminate between the core mode and inner cladding modes of a double-clad fiber with such a small CCR of claim 1.
As true with all dependent claims, dependent claims 14, 15-17, and 22 are also allowable because they depend from now deemed allowable independent claim 1. Besides, in sentences quoted by the Examiner in reference to claim 14, Ball talks about using his laser to pump a "standard" single-mode Er-doped amplifier which is 77 and fiber 80, not the laser 78 that the Examiner might have assumed. Such an amplifier 80 does not HAVE a second cladding and therefore does not have the inner cladding area or CCR. In fact, double-clad amplifiers are not mentioned by Ball at all to be able to obviate the Applicant's claims. Claim 14 talks specifically about an amplifier, specifically about Er and only in dependence to claim 1, demanding CCR of 2 to 25 which was not taught by any of the references.

Regarding claim 21, Ball does not teach continuously varying the indices in the passage quoted by the Examiner in Col. 5, lines 34-44. Specifically, Ball does not teach the continuously varying of the refractive indices of the core and inner claddings and does not disclose restrictions on the modal overlap as taught by claim 21 to obviate this claim.

The Examiner has rejected claims 5, 8, and 9 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Ball, et al. (U.S. Patent No. 6,031,849) in view of Ohishi, et al. (U.S. Patent No. 5,309,452) and in further view of Sanghera, et al (U.S. Patent No. 5,973,824).

Regarding claims 5, 8 and 9, as with the previously made arguments of misunderstood reference and unsuggested combination, Sanghera discusses antimony as less than 2 mol. % addition to chalcogenide glasses and does not disclose antimony-silicate glasses, which have unique spectroscopic properties. Other references describe antimony silicates, but not in application to an optically active 3-level fiber for use in lasers and amplifiers.

Regarding claims 8 and 9, it is generally known to use different glass compositions to modify thermal properties. However, Sanghera and other references do not disclose the unsuggested combination. The references never taught why limiting the CTE mismatch between inner and outer cladding is required. The relevance was never taught and specifically never associated with the high NA glass waveguides such as the inner cladding of the instant Application. Hence, the Applicant's use to improve mechanical stability and reliability was never contemplated by the references to have the same problem and solution solved by the claimed invention.

The Examiner has rejected claim 18 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Ball, et al. (U.S. Patent No. 6,031,849) in view of Ohishi, et al. (U.S. Patent No. 5,309,452) and in further view of DiGiovanni (U.S. Patent No. 5,949,941).

Regarding claim 18, DiGiovanni discloses a variety of shapes, including one shown in his Fig. 3D, for achieving polarization-maintaining properties but **not** for facilitating the unobviated decreased CCR as in the unsuggested combination of the instant Application.

3. Conclusion

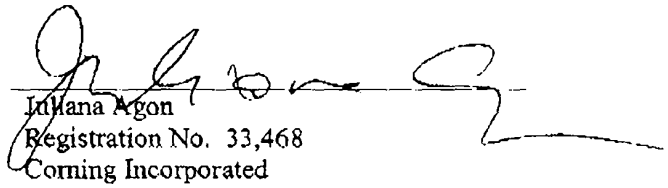
Based upon the above remarks, and papers of record, Applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests reconsideration of the pending claims and a prompt Notice of Allowance thereon.

Applicant believes that no extension of time is necessary to make this Response timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Juliana Agon at 607-974-6574.

September 10, 2003
Date

Respectfully submitted,
CORNING INCORPORATED



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CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. § 1.8

I hereby certify that this paper and any papers referred to herein are being transmitted by facsimile to the U.S. Patent and Trademark Office at 703-872-9318 on:

September 10, 2003
Date

Juliana Agon — Date

APPENDIX A
Cited by Applicant May 24, 2001

Document Number	Date	Name	Class	Sub-Class
5,048,026	09/10/91	Shaw, et al	375	6
6,031,849	02/29/00	Ball, et al	372	6
5,864,645	01/26/99	Zellmer, et al	385	126
5,530,710	06/25/96	Grubb	372	6
6,157,763	12/05/00	Grubb, et al	385	126
5,920,582	07/06/99	Byron	372	6
5,949,941	09/07/99	DiGiovanni	385	127
5,533,163	07/02/96	Muendel	385	126
4,815,079	03/21/89	Snitzer, et al	372	6
6,188,509 B1	02/13/01	Lee, et al	359	341
6,192,179 B1	02/20/01	Berkey, et al	385	126
6,128,430	10/03/00	Chu, et al	385	142
6,104,733	08/15/00	Espindola, et al	372	6
5,930,436	07/27/99	Okamura, et al	385	127
4,439,007	03/27/84	Lazay, et al	350	96.30
4,923,277	05/08/90	Okazaki, et al	350	96.29
4,691,990	09/08/87	Cohen	350	96.33
Re. 35,946	11/03/98	Ainslie, et al	385	127
EP 1 076 249 A1	02/14/01	Europe	G02B 6/16	

Cited by Examiner June 17, 2003

5,309,452	5-1994	Ohishi, et al	372	6
4,815,079	3-1989	Snitzer, et al	372	6
5,485,480	1-1996	Kleinerman, Marcos Y.	372	6
5,530,710	6-1996	Grubb, Stephen G.	372	6
5,949,941	9-1999	DiGiovanni, David John	385	127
5,973,824	10-1999	Sanghera, et al	359	342
6,031,849	2-2000	Ball, et al	372	6